

***Plectranthias takasei*, new species of anhiadine fish from southern Japan (Teleostei: Serranidae)**

ANTHONY C. GILL^{1,2}, YI-KAI TEA³ & HIROSHI SENOU⁴

¹*Macleay Museum and School of Life and Environmental Sciences, A12 – Macleay Building, The University of Sydney, New South Wales 2006, Australia. E-mail: anthony.c.gill@sydney.edu.au*

²*Ichthyology, Australian Museum, 1 William Street, Sydney, New South Wales 2010, Australia.*

³*90 Carillon Avenue, Newtown, NSW 2042, Australia. E-mail: teayk1@gmail.com*

⁴*Kanagawa Prefectural Museum of Natural History, 499 Iryuda, Odawara, Kanagawa 250-0031, Japan.
E-mail: senou@nh.kanagawa-museum.jp*

Abstract

Plectranthias takasei is described from two specimens collected in Izu Oceanic Park, Sagami Bay, Honshu, Japan. It is distinguished from congeners in having the following combination of characters: dorsal rays X, 15; no fleshy flaps on dorsal-fin spines; pectoral rays 13, all unbranched; branched caudal-fin rays 8 + 7; lateral line scales 28 (including intermittent and terminal pitted scales); circumpeduncular scales 12; fourth dorsal-fin spine longest; and preopercle without antrorse spines or serrations ventrally, with 2–3 weak serrations or crenulations posteriorly.

Key words: ichthyology, taxonomy, morphology, Izu Oceanic Park, Sagami Bay, Honshu

Introduction

Species of the anhiadine serranid genus *Plectranthias* Bleeker (1873) are small (mostly less than 100 mm SL, though several species reach sizes exceeding 200 mm SL), reef-associated fishes found through the warm temperate to tropical waters in the Indo-Pacific, eastern Pacific and western Atlantic. The genus was revised by Randall (1980), who recognised 30 species, but an additional 21 species have been subsequently described (see Allen & Walsh 2015: tab. 1). Many species occur in deep reef habitats, are poorly represented in museum collections, and have not been observed alive. Conversely, several species have been photographed by divers, but have not yet been scientifically described. One such species has been photographed at depths of 50 m or more on rocky reefs in Izu Oceanic Park, Sagami Bay, Honshu, Japan. We herein describe the species on the basis of two specimens.

Materials and methods

Measurements were recorded to the nearest 0.1 mm using digital calipers. All measurements to the snout tip were made to the midanterior part of the snout. Length of specimens are given in mm standard length (SL), which was measured from the snout tip to the middle of the caudal peduncle at the vertical through the posterior edge of the dorsal hypural plate. Head length was measured from the snout tip to the posteriormost edge of the opercular membrane. Snout length was measured over the shortest distance from the snout tip to the orbital rim. Orbit diameter was measured as the horizontal width of the bony orbit. Bony interorbital width was measured where least. Upper jaw length was measured from the snout tip to the posterior edge of the maxilla. Maxilla width was measured where greatest. Predorsal, preanal and prepelvic lengths were measured from the snout tip to the base of the first spine of the relevant fin. Body width was measured at the bases of the pectoral fins. Caudal peduncle

length was measured from the base of the last anal-fin ray to the ventral edge of the caudal fin at the vertical though the posterior edge of the ventral hypural plate. Caudal peduncle depth was measured where least. Pectoral fin length was measured as the length of the longest middle ray. Caudal fin length was measured as the length of the lowermost ray on the dorsal hypural plate.

The last ray in the dorsal and anal fins is divided at its base and was counted as a single ray. Traditionally researchers have diagnosed the principal caudal-fin rays to include the branched rays plus one ray above and one ray below (e.g., Hubbs & Lagler 1947). We believe this is problematic, because fin-ray branching in certain fishes may vary ontogenetically (particularly in fishes with rounded caudal fins, such as some *Plectranthias* species). Moreover, such definition adds no new information than is already given in branched ray counts. A more refined definition is needed in order to make more accurate homology assessment of other structures (e.g., numbers, shapes and relative sizes of procurent rays, such as proposed by Johnson 1975). Therefore, we have instead adopted a topological definition of principal caudal-fin rays (based on Gill 2004): the uppermost principal caudal-fin ray is the ray articulating with hypural 5, and the lowermost principal caudal-fin ray is the ray articulating between the distal tips of the parhypural and the haemal spine of preural centrum 2. Counts of principal and branched caudal-fin rays are presented in the form upper + lower, where the upper rays are those associated with hypurals 3–5, and lower rays are those associated with hypurals 1–2 and the parhypural. Procurent caudal-fin rays are those dorsal and ventral to the principal rays. Gill-raker counts were of the outer rakers on the first arch, including rudiments; the angle raker is included in the lower-limb (second) count. Counts of pseudobranch filaments included all rudiments.

Osteological details were determined from x-radiographs. Vertebral counts are presented as precaudal + caudal. The anterior-most vertebra having its haemal spine associated with a pterygiophore of the anal fin was considered as the first caudal vertebra, the urostylar complex as the last. Terminology of intermuscular bones follows Patterson and Johnson (1995) and Johnson and Patterson (2001). The predorsal formula, for configuration of supraneural, dorsal pterygiophores and neural spines, follows Ahlstrom *et al.* (1976).

Comparison with related species are based mostly on literature accounts, particularly the important summaries by Randall (1980, 1996) and Heemstra and Randall (2009).

***Plectranthias takasei* new species**

New standard Japanese name: Hinomaru-hanadai

English common name: Hinomaru perchlet

Figures 1–5

Holotype. KPM-NI 21068, 40.0 mm SL, Japan, Honshu, Sagami Bay, E of Izu Peninsula, Izu Oceanic Park, 52 m, collected by W. Takase, 18 March 2008.

Paratype. KPM-NI 21286, 36.0 mm SL, Japan, Honshu, Sagami Bay, E of Izu Peninsula, Izu Oceanic Park, 55 m, donated by K. Endoh, April 2008.

Diagnosis. The following combination of characters distinguishes *P. hinomaru* from congeners: dorsal rays X,15; no fleshy flaps on dorsal-fin spines; pectoral rays 13, all unbranched; branched caudal-fin rays 8 + 7; lateral line scales 28 (including intermittent and terminal pitted scales); circumpeduncular scales 12; fourth dorsal-fin spine longest; and preopercle without antrorse spines or serrations ventrally, with 2–3 weak serrations or crenulations posteriorly.

Description. (Data given first for holotype, followed where different by data for paratype in parentheses.) Dorsal rays X,15, all segmented rays branched; anal rays III,7, all segmented rays branched; pectoral rays 13/13, all rays unbranched; pelvic fin I, 5, all segmented rays branched; upper procurent caudal-fin rays 4; lower procurent caudal-fin rays 4; principal caudal-fin rays 9 + 8; branched caudal fin rays ? + 7 (8 + 7); total caudal-fin rays 25; lateral line complete with 28 tubed scales on the left side, and 20 tubed scales followed by a pitted scale and 7 tubed scales on the right side (23 tubed scales followed by a pitted scale, 3 tubed scales then a pitted scale on the left side; scales damaged on right side); scales above lateral line to origin of dorsal fin 2/2; scales above lateral line to base of middle dorsal spine 3/2 (2/?); scales below lateral line to origin of anal fin 9/9 (9/?); diagonal rows of scales on cheek 5; predorsal scales 18 (17), extending to just short of posterior nostrils; circumpeduncular scales 12; gill rakers 4 + 12, the upper 3 and lower 5 rudiments (4 + 11, the upper 3 and lower 5 rudiments); pseudobranchial filaments 11 (10); branchiostegal rays 7.

Vertebrae 9 + 17; supraneurals 3, the third reduced in size; predorsal formula 0/0+0/2/1+1; no trisegmental pterygiophores associated with dorsal and anal fins; ribs present on vertebrae 3 through 9; epineurals present on vertebrae 1 through 13 (1 through 12); parhypural and hypurals autogenous; well-developed hypurapophysis on parhypural; epurals 3; single uroneural (posterior uroneural absent); ventral tip of cleithrum with well-developed posteroventral process (Figure 5).

Dorsal-fin spines without fleshy tabs on their distal tips; fourth dorsal spine longest; dorsal fin deeply incised before first segmented-fin ray; second anal-fin spine longest and stoutest; anal fin rounded with third segmented ray longest; caudal fin truncate to slightly rounded, with some ray branches slightly elongated past fin margin; lower 7 pectoral fin rays somewhat thickened, with membranes between thickened rays deeply incised; eighth (counting from dorsal-most) pectoral ray longest, reaching vertical through posterior edge of anal-fin base; pelvic fins short, not reaching anus, second segmented ray longest.

Morphometric values are summarised in Table 1.

TABLE 1. Morphometric values for *Plectranthias takasei*, expressed as percentage SL.

	KPM-NI 21068 (holotype)	KPM-NI 21286 (paratype)
SL (mm)	40.0	36.0
Greatest body depth	38.3	35.0
Body depth at anal-fin origin	35.5	32.5
Body width	21.0	22.2
Head length	42.5	42.8
Snout length	9.3	8.9
Orbit diameter	10.8	10.8
Bony interorbital width	4.0	3.9
Upper jaw length	18.0	19.2
Maxilla width	5.5	6.4
Caudal peduncle length	20.5	19.7
Caudal peduncle depth	14.8	15.0
Predorsal length	40.0	40.8
Preanal length	68.0	66.9
Prepelvic length	35.3	36.7
Dorsal fin base length	48.8	51.4
First dorsal spine	4.0	4.2
Longest dorsal spine (number)	17.0 (4 th)	15.3 (4 th)
First segmented dorsal ray	14.0	11.7
Longest segmented dorsal ray (number)	17.8 (7 th)	18.3 (5 th)
Anal fin base length	15.0	15.0
First anal spine	8.0	8.6
Second anal spine	17.3	16.9
Third anal spine	14.3	14.2
First segmented anal ray	19.5	broken
Longest segmented anal ray (number)	21.8 (3 rd)	21.4 (3 rd)
Caudal fin length	broken	26.7
Pectoral fin length	39.0	38.6
Pelvic fin spine	14.3	15.0
Pelvic fin length	24.0	25.0



FIGURE 1. *Plectranthias takasei*, holotype, KPM-NI 21068, 40.0 mm SL, Izu Oceanic Park, Sagami Bay, Honshu, Japan. (photo by H. Senou)



FIGURE 2. *Plectranthias takasei*, paratype, KPM-NI 21286, 36.0 mm SL, Izu Oceanic Park, Sagami Bay, Honshu, Japan. (photo by H. Senou)

Mouth large, slightly oblique, posterior margin of maxilla reaching almost to vertical through posterior edge of eye; maxilla expanded posteriorly, with long, low, lateral ridge running parallel to dorsal margin; mouth terminal; upper jaw with several fixed, short stout outer canines on either side of symphysis flanked internally by villiform band with about 5–8 rows of depressible, smaller, sharp-tipped teeth, with inner rows becoming progressively longer, band reducing to 3 rows posteriorly; lower jaw with villiform band of about 4–5 rows of small depressible teeth at symphysis, teeth becoming progressively longer on inner rows, an enlarged, curved canine on middle of jaw, band narrows to single row posteriorly; vomer with roughly V-shaped band of 2–4 rows of sharp-tipped conical teeth; palatine with a band of 2–3 rows of small, sharp-tipped conical teeth; ectopterygoid and mesopterygoid edentate; tongue narrow, pointed and edentate.

Opercle with 3 flat spines, middle spine longest, upper spine concealed by scales; preopercle with 2 (3) weak serrations or crenulations on lower part of posterior margin, ventral margin smooth; interopercle and subopercle smooth. Anterior nostril positioned at middle of snout, tubular with small flap on posterior rim; posterior nostril at anterior border of orbit, with slightly raised rim but no flap.



FIGURE 3. *Plectranthias takasei*, underwater photo in 60 m, Izu Oceanic Park, Sagami Bay, Honshu, Japan. (photo by W. Takase)

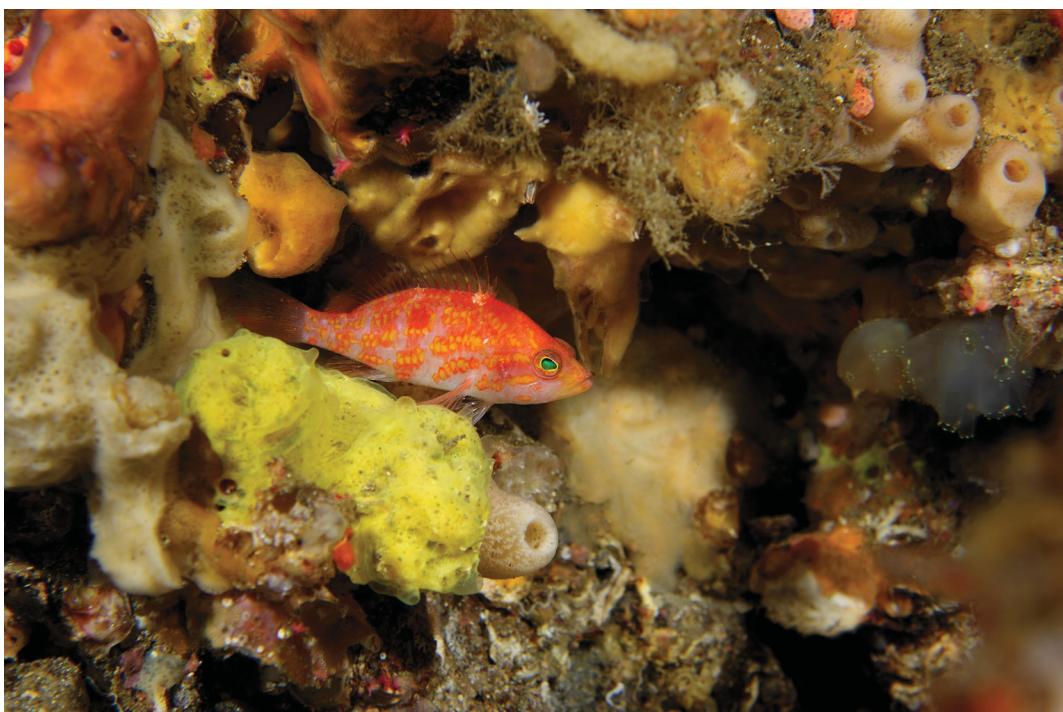


FIGURE 4. *Plectranthias takasei*, underwater photo in 55 m, Izu Oceanic Park, Sagami Bay, Honshu, Japan. (photo by W. Takase)

Scales ctenoid with peripheral cteni (Roberts 1993); lateral line broadly arched over pectoral fin following body contour to caudal-fin base; no scales on chin, branchiostegal membranes, maxilla or snout; no auxiliary scales on head or body; dorsal fin with intermittent row of scales along base of fin; anal fin with low scaly sheath basally, with some small scales extending on to fin membranes; caudal fin with scaly basal sheath, with small scales extending on to basal third to half of fin membranes; pectoral fins with basal sheath and small scales extending on to fin membranes.

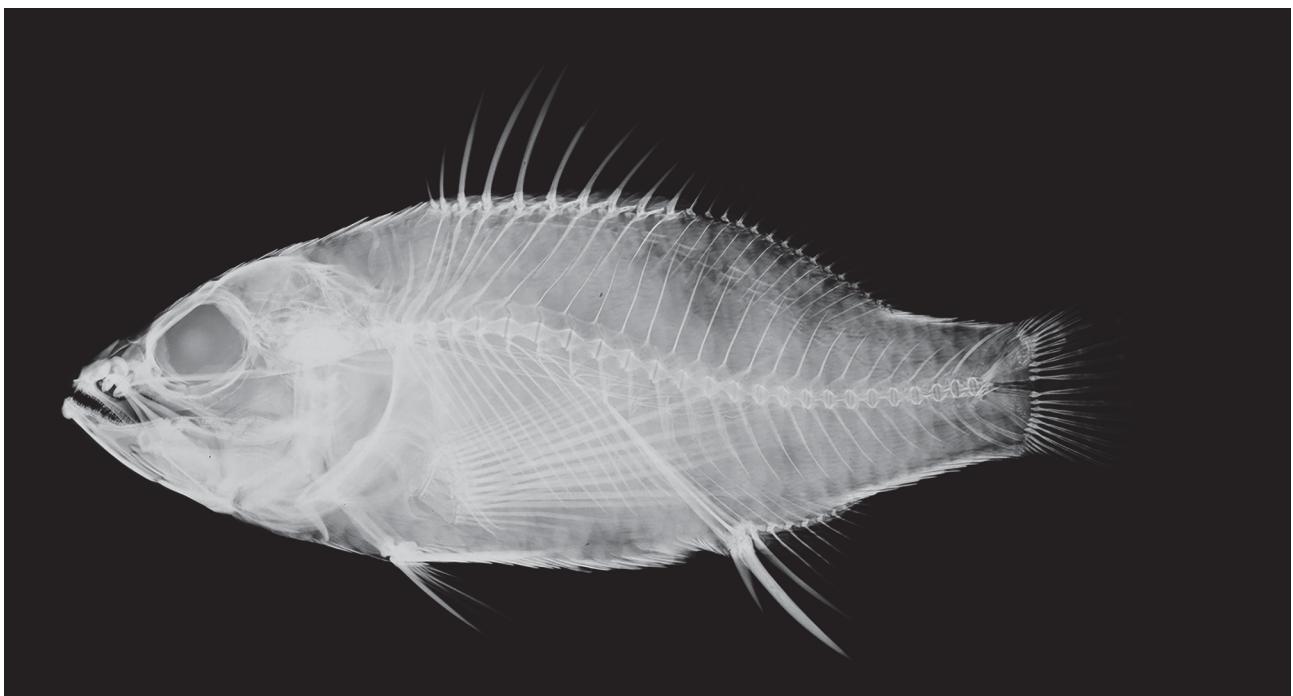


FIGURE 5. *Plectranthias takasei*, holotype, KPM-NI 21068, 40.0 mm SL, x-radiograph. (radiograph by H. Senou)

Colour in life (based on colour photos of the holotype and paratype when freshly dead, and underwater photos of individuals at Izu Oceanic Park; Figures 1–4): Head and body pale pink to white; nape, top of head and front of lips orange to reddish brown; maxilla and lips sometimes bright yellow; iris pale pink with two orange oblique stripes (one above and one below pupil), bluish grey spots anteriorly and posteriorly, and sometimes small yellow spots ventrally; large (up to twice orbit diameter) greyish red to bright red spot on upper sides below middle of dorsal fin; pink to orange-red oblique bar extending below large red spot to small (pupil-sized) greyish red to red spot near anal-fin origin; small (pupil- to orbit-sized) greyish red to red spot below lateral line and vertical through middle of soft dorsal, connected to smaller reddish grey to red spot at termination of anal fin by pink to orange-red oblique bar; pink to orange-red bar from termination of dorsal fin to small reddish grey to red spot ventrally at middle of caudal peduncle; a dorsal and a ventral reddish grey to red spot at posterior end of caudal peduncle, these connected by pink to orange red vertical bar; reddish grey to red and pink markings on head and body overlain with a series of oblique to horizontal stripes composed of closely spaced, orange-edged, bright yellow to gold spots (one per scale), stripes usually broken into segments and occurring only when passing directly over reddish grey to red or pink markings; first stripe short and indistinct, from orbital rim at about 1 o'clock position to middle of nape; second stripe from above tip of preopercle to lateral-line origin, tracking lateral line to just behind vertical through dorsal-fin origin, curving ventrally along lower edge of large red spot, and ending at middle of caudal-fin base; third stripe extending obliquely from behind and below lateral-line origin to just above anal-fin origin, then horizontally to ventral edge of caudal-fin base; fourth stripe from about 3 o'clock position on orbital rim, above pectoral-fin base, to lower part of abdomen (just above and in front of anus); fifth stripe from about 5 o'clock position on orbital rim to pectoral-fin base; sixth stripe very short (2–3 scales long) and horizontal, near anterior tip of preopercle; additional yellow or gold spots sometimes present beneath dorsal-fin base and dorsal edge of caudal peduncle; silvery white markings sometimes present on upper snout, on nape, below dorsal-fin origin, below end of spinous part of dorsal fin, at termination of dorsal fin, on upper part of caudal-fin base, on operculum between fourth and fifth gold stripes, and along ventral edge of fifth gold stripe; dorsal fin pinkish or reddish to yellowish hyaline, sometimes with silvery white markings from body encroaching on to fin base; anal fin pinkish to yellowish hyaline, pale pink anteriorly, with reddish grey to red markings at origin and termination of fin encroaching on to fin base; caudal fin pinkish to reddish hyaline; pectoral fins pinkish hyaline; pelvic fins pinkish hyaline, pale blue to pale pink anteriorly.

Colour in preservative: Pale tan, dusky grey-brown on upper part of head and nape, with intermittent dusky grey-brown markings along dorsal part of body and caudal peduncle; large greyish red to red spot on midside and

smaller greyish red to red spots (at anal-fin origin, below middle of soft dorsal, at termination of dorsal fin, at termination of anal fin, and dorsally and ventrally at end of caudal peduncle) become dusky grey-brown; all other markings obsolete.

Habitat and distribution. *Plectranthias takasei* is known only from Izu Ocean Park, where it has been collected and photographed on rocky reefs at depths of 48–60 metres.

Comparisons. *Plectranthias takasei* is distinct from most members of the genus in having in combination: a complete lateral line; no antrorse spines ventrally on the preopercle; 15 segmented dorsal-fin rays; and pectoral fins with 13 unbranched rays. Five congeners have a similar combination of characters: *P. maugei* Randall (1980), *P. morgansi* (Smith 1961), *P. cirrhitoides* Randall (1980), *P. foresti* Fourmanoir (1977) and *P. megalepis* (Günther 1880). *Plectranthias maugei*, known only from three type specimens from off Madagascar, differs in having a lunate caudal fin with 14 branched rays (versus weakly rounded to truncate with 15 branched rays in *P. takasei*) and short fleshy flaps (cirri) on the tips of the dorsal-fin spines. *Plectranthias morgansi*, from the Western Indian Ocean, has the third (versus fourth) dorsal spine longest, bearing a long fleshy tab (versus no tab), 14 (versus 12) circumpeduncular scales, fine serrations on the preopercle (versus 2–3 weak serrations or crenulations on the posterior margin of the preopercle) and a distinctly serrated (versus smooth) interopercle. *Plectranthias cirrhitoides*, from Rapa, differs in having 14 circumpeduncular scales, the first segmented dorsal-fin ray unbranched (versus branched) and a shallower body (greatest body depth 31.0–32.4 versus 35.0–38.3 % SL). *Plectranthias foresti*, from the West Pacific, differs in having an emarginate caudal fin with 14 branched caudal-fin rays (versus weakly rounded to truncate with 15 branched rays), 18–29 serrae on the hind margin of the preopercle, and the second to fourth segmented dorsal-fin rays filamentous (versus not filamentous). *Plectranthias megalepis*, known only from the lectotype from the Kai Islands, Indonesia, differs in having 14 circumpeduncular scales, 18–21 serrae on the posterior margin of the preopercle, and the top of the head scaled anteriorly only to about the mid interorbital area (versus almost to posterior nostrils).

The live coloration of *P. takasei* is distinctive, and will serve to distinguish the species from the above species and all other congeners. *Plectranthias takasei* may be confused with several species that have yellow to red spots on a pale body — such as *P. sagamiensis* (Katayama 1964), *P. elongatus* Wu *et al.* (2011), *P. xanthomaculatus* Wu *et al.* (2011), *P. inermis* Randall (1980) and *P. flammeus* Williams *et al.* (2013) — but details of the colour pattern are distinctive for *P. takasei*. In particular, the combination of a large red spot on the mid-side and oblique stripes of closely spaced, orange-edged, bright yellow to gold spots are diagnostic.

Etymology. The species is named for Mr Wataru Takase, who collected the holotype. The Japanese standard name and English common names refer to the prominent red spot on the side, which is reminiscent of the red disk (rising sun) in the Japanese flag (commonly called Hinomaru, 'the sun disk').

Remarks. Placement of the new species in *Plectranthias* should be regarded as provisional. The generic classification of the Anthiadinae is unsatisfactory, with few genera cladistically diagnosed by synapomorphies. The two largest genera, *Plectranthias* and the Indo-Pacific genus *Pseudanthias* Bleeker (1871) are particularly problematic. Not only is neither genus defined on the basis of synapomorphies, but both show considerable variation in characters that have been used to diagnose other anthiadine genera. For example, *Plectranthias* varies in the number of supraneural bones, degree of squamation on the head, presence or absence of antrorse spines on the ventral edge of the preopercle, number of lateral-line scales, and number of branched caudal-fin rays. It is likely that further studies will result in the reassignment of some species to new genera or to nominal genera placed in the synonymy of *Plectranthias* by Randall (1980).

Acknowledgements

This study was supported in part by JSPS KAKENHI Grant Number JP24370041 and JP24501278; the "Biological Properties of Biodiversity Hotspots in Japan" project of the National Museum of Nature and Science, Tsukuba, Japan. We thank Wataru Takase for providing the holotype and excellent underwater photographs of the new species, and Kiyoshi Endoh for providing the paratype. Sally Reader, Amanda Hay and Mark McGrouther assisted with the loan of the specimens, and provided access to library and other facilities at the Australian Museum. G.R. Allen reviewed the manuscript and provided helpful comments.

References

Ahlstrom, E.H., Butler, J.L. & Sumida, B.Y. (1976) Pelagic stromateoid fishes (Pisces, Perciformes) of the eastern Pacific: kinds, distributions, and early life histories and observations on five of these from the northwest Atlantic. *Bulletin of Marine Science*, 26, 285–402.

Allen, G.R. & Walsh, F. (2015) *Plectranthias bennetti*, a new species of anhiine fish (Pisces: Serranidae) from the Coral Sea, Australia. *Journal of the Ocean Science Foundation*, 16, 82–89.

Bleeker, P. (1871) *Atlas ichthyologique des Indes Orientales Néerlandaises*. Gouvernement colonial néerlandais, volume 7, pls 287–288

Bleeker, P. (1873) Sur les espèces indo-archipelagiques d'*Odontanthias* et de *Pseudopriacanthus*. *Nederlandsch Tijdschrift voor de Dierkunde*, 4, 235–240.

Fourmanoir, P. (1977) Description de deux nouvelles espèces d'Anthiinae (famille Serranidae). *Cahiers du Pacifique*, 20, 267–270.

Gill, A.C. (2004) Revision of the Indo-Pacific dottyback fish subfamily Pseudochrominae (Perciformes: Pseudochromidae). *Smithiana Monograph*, 1, 1–214, pls 1–12.

Günther, A. (1880) Report on the shore fishes procured during the voyage of H.M.S. Challenger in the years 1873–1876. In: *Report on the Scientific Results of the Voyage of H. M. S. Challenger During the Years 1873–76. Zoology*, 1 (part 6), 1–82, pls. 1–32.

Heemstra, P.C. & Randall, J.E. (2009) A review of the anhiine fish genus *Plectranthias* (Perciformes: Serranidae) of the Western Indian Ocean, with description of a new species, and a key to the species. *Smithiana Bulletin*, 10, 3–17.

Hubbs, C.L. & Lagler, K.F. (1947) Fishes of the Great Lakes Region. *Cranbrook Institute of Science, Bulletin*, 26, 1–186.

Katayama, M. (1964) A new genus and species of anthimid fish from Sagami Bay, Japan. *Bulletin of the Faculty of Education Yamaguchi University*, 13, 27–33.

Johnson, G.D. (1975) The procurent spur: an undescribed perciform caudal character and its phylogenetic implications. *Occasional Papers of the California Academy of Sciences*, 121, 1–23.

Johnson, G.D. & Patterson, C. (2001) The intermuscular system of acanthomorph fishes: a commentary. *American Museum Novitates*, 3312, 1–24.
[https://doi.org/10.1206/0003-0082\(2001\)312%3C0001:TISOAF%3E2.0.CO;2](https://doi.org/10.1206/0003-0082(2001)312%3C0001:TISOAF%3E2.0.CO;2)

Patterson, C. & Johnson, G.D. (1995) The intermuscular bones and ligaments of teleostean fishes. *Smithsonian Contributions to Zoology*, 559, 1–83, 1 foldout table.

Randall, J.E. (1980) Revision of the fish genus *Plectranthias* (Serranidae: Anthiinae) with descriptions of 13 new species. *Micronesica*, 16, 101–187.

Randall, J.E. (1996) Two new anhiine fishes of the genus *Plectranthias* (Perciformes: Serranidae), with a key to the species. *Micronesica*, 29, 113–131.

Roberts, C.D. (1993) Comparative morphology of spined scales and their phylogenetic significance in the Teleostei. *Bulletin of Marine Science*, 52, 60–113.

Smith, J.L.B. (1961) Fishes of the family Anthiidae. *Ichthyological Bulletin, Department of Ichthyology, Rhodes University*, 21, 359–369.

Williams, J.T., Delrieu-Trottin, E. & Planes, S. (2013) Two new fish species of the subfamily Anthiinae (Perciformes, Serranidae) from the Marquesas. *Zootaxa*, 3647 (1), 167–180.
<https://doi.org/10.11646/zootaxa.3647.1.8>

Wu, K.-Y., Randall, J.E. & Chen, J.-P. (2011) Two new species of anhiine fishes of the genus *Plectranthias* (Perciformes: Serranidae) from Taiwan. *Zoological Studies*, 50, 247–253.